

INTERSPERSED REQUESTS: A NONAVERSIVE PROCEDURE FOR REDUCING AGGRESSION AND SELF-INJURY DURING INSTRUCTION

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Interspersed requests are simple commands, with a high likelihood of being followed correctly, that are interspersed among instructional trials to increase the probability that a learner will attempt to perform new or difficult tasks without engaging in aggression or self-injurious behavior. This report presents two assessments of the effect of interspersed requests on aggression and self-injury during instruction. The participants were individuals with severe mental retardation who used aggression and self-injury to avoid difficult instructional situations. Results from both studies indicate that interspersed requests were effective at increasing the responsiveness of the learners to instructions and reducing levels of aggression and self-injury.

DESCRIPTORS: functional analysis, aggressive behavior, self-injurious behavior, autistic children, interspersed requests

Aggression and self-injury can be effective methods of avoiding difficult instructional situations (Carr, 1977; Durand & Crimmins, 1988; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982). Carr, Taylor, and Robinson (in press) caution that in situations in which aggression and self-injury are associated with instruction, two undesirable effects may result. The student may learn to use aggression and self-injury to avoid difficult learning demands, and the teacher may inadvertently learn to modify instructional content so that only known or easy

tasks are presented. As a result, students may not receive instruction on adaptive behaviors critical for participation in the community (Brown, Nietupski, & Hamre-Nietupski, 1976). Therefore, we must find instructional procedures that are successful with students who have learned to avoid new or difficult tasks through aggression and self-injury.

Recommendations for reducing aggressive behavior during instruction have been made by Dunlap and Koegel (1980) in their work with autistic students. Their procedure interspersed maintenance tasks within typical learning sessions. Maintenance tasks are those that the student has already mastered, and are presented after two to four trials with new, more difficult, tasks. Results indicate that the inclusion of maintenance tasks improves acquisition of new tasks (Dunlap, 1984; Dunlap & Koegel, 1980; Dunlap & Plenis, 1988; Neef, Iwata, & Page, 1980) and facilitates reduction in aggressive behavior during instruction (Winterling, Dunlap, & O'Neill, 1987).

Another response to the need to reduce aggres-

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sion during instruction is the "hard task" procedure recommended by Engelmann and Colvin (1983), which involves the delivery of three to five requests immediately prior to presenting a difficult task or situation. The requests should (a) require responses that take no more than a few seconds to complete, (b) be responses that the learner has a history of performing with a high probability of accuracy and speed, (c) be followed by praise, (d) be delivered in rapid succession, and (e) be delivered immediately prior to the presentation of the difficult task or situation (Storey & Horner, 1988). The objective is to deliver short, known tasks that are performed correctly and are followed by reinforcement. As a result, the learner experiences success and praise immediately prior to the delivery of a task or situation presumed to be associated with high effort, failure, and comparatively low levels of reinforcement.

The procedure described by Engelmann and Colvin (1983) has been assessed by Singer, Singer, and Horner (1987) as an antecedent intervention for reducing aggression and refusal. Elementary school-aged students with moderate and severe disabilities were more likely to return to work from recess, and less likely to be aggressive, when the instruction to return to work was preceded by three to five easy requests.

Recently, Mace *et al.* (1988) reported impressive success with a similar intervention derived from Nevin's work with nonhuman subjects on response strength under varying schedules of reinforcement (Nevin, 1974, 1979; Nevin, Mandell, & Atak, 1983). In a series of five elegant analyses, Mace *et al.* (1988) documented that the delivery of a high-probability command sequence immediately prior to the delivery of a low-probability command increased the likelihood of compliance with the low-probability command. The high-probability command sequence involved presenting the learner with three or four commands that were short, simple, and very likely to be performed correctly.

The present report extends and integrates the above research on use of interspersed, high-probability requests with aggressive and self-injurious behaviors. Two studies that focus on instruction of

students with severe disabilities who use aggression and self-injury to escape difficult learning situations are presented. The specific research question was whether a functional relationship exists between the use of interspersed, high-probability requests and the likelihood that students will (a) attempt to complete a difficult task and (b) use aggression and self-injury when presented with difficult tasks. The first study assessed the immediate effects of the procedure in a residential setting, and the second assessed the procedure under more extended training conditions in a typical school environment.

STUDY 1

METHOD

Participants and Setting

Three youths (Abel, Bob, and Carol) between the ages of 12 and 14 participated in the study. Each participant had been diagnosed as severely mentally retarded based on IQ scores derived from the Vineland Social Maturity Scale (IQ = 12, 14, and 23, respectively). At the time of the study, the participants were living in a community-based group home and were receiving instruction on basic social and self-help skills such as toileting, dressing and communication. Each individual had a long history of self-abuse, aggression, or destructive behavior during instruction. None of the participants were taking prescription medications. All training and data collection were conducted in the group home.

Trainers

Two senior staff members at the group home served as trainers. They had received training in instructional procedures as defined by Bellamy, Horner, and Inman (1979). Two additional group home staff members with extensive participant contact served as trainers during the final phase of the study.

Tasks

Staff members were asked to identify two tasks from current individualized plan objectives for each participant. The easy task was selected because the

participant had a consistent history of performing the task correctly. The hard task was selected on the basis of staff reports that the participant seldom performed the task to criterion without assistance. An easy task was operationally defined as a task in which 70% or more of the trials within a session were performed correctly without trainer assistance. A hard task was operationally defined as a task in which 33% or fewer of the trials within a session were performed correctly without trainer assistance. Easy tasks for the 3 participants were (a) pouring water from a pitcher into a receptacle, (b) following a "do this" request (e.g., put glass on table), and (c) putting on a pullover T-shirt. Hard tasks were (a) sorting silverware from the dishwasher, (b) following two-step instructions, and (c) putting on underwear.

Measurement

Dependent variables. Dependent variables for the study were aggression or self-injury, and attempting to complete the task. Aggression or self-injury was defined as pulling own hair, pulling trainer's hair, biting self, biting trainer, hitting head or face with hand, hitting trainer, or lunging into trainer. Attempting to complete the task was defined as initiating the first response in the requested response chain (e.g., picking up the pitcher of water) within 3 s of the request.

The dependent variables were measured by a trained data collector from observations of videotapes collected from all sessions. Because Abel performed short bursts of aggression, both his aggression and attempts were recorded as the percentage of trials in which the dependent variable occurred across 12 trial blocks. A block of 12 trials required 2 to 3 min to complete. Bob and Carol performed longer bouts of aggression or self-injury. As such, aggression or self-injury was monitored using an interval-recording format. Observers recorded the percentage of 10-s intervals in which aggression or self-injury occurred during any portion of the interval across 2-min observation periods. Bob and Carol's attempts were monitored in terms of percentage of trials attempted in the 2-min observation period.

Observer agreement for dependent variables. A second observer independently scored the same videotapes to assess trial-by-trial (for Abel) or interval-by-interval (for Bob and Carol) agreement. Agreement was recorded if both observers scored a trial or interval the same. Percentage of interobserver agreement was evaluated per 12-trial block for Abel and per 2-min observation for Bob and Carol. Percentage agreement was calculated by taking the number of trials or intervals in which the two observers agreed that a targeted behavior occurred (aggression or self-injury or attempts), dividing that number by the total number of trials or intervals in which either observer scored that targeted behavior as occurring, and multiplying by 100%. Interobserver agreement was assessed for all sessions in the study and averaged 96% (range, 75% to 100%) for aggression or self-injury and 95% (range, 88% to 100%) for attempts to complete a task.

Independent variables. A major effort was made to monitor both the implementation of the independent variable (use of interspersed requests) and potential variables that could confound interpretation of the results (instructor praise, percentage of trials correct, and number of trials presented per minute). Observers viewed videotapes of the training sessions and coded the number of 10-s intervals in which interspersed requests were used and instructors delivered praise. In addition, the observers monitored the number of trials presented per minute during each session.

The difficulty of tasks across the study was an important variable, and task difficulty was assessed in two ways. The percentage of trials completed correctly without trainer assistance was recorded by the trainer per 12-trial block (for Abel) or per 2-min observation period (for Bob and Carol). In addition, three individuals familiar with special education, but unaffiliated with the study, were asked to observe randomly selected 12-trial blocks (or 2-min observation periods) from easy, hard, and hard + interspersed phases of the study. They used a 10-point Likert scale to rate the difficulty of the task for the participant in each period (or block of trials).

Observer agreement for independent variables.

Interobserver agreement was assessed for each of the independent variables (except the rating of task difficulty by observers) following the same procedures defined for the dependent variables. In all cases, agreement averaged 92.8% or greater with no individual score below 80%.

Social validation. Wolf (1978) recommends that an important index of the success of an intervention is the extent to which procedures are perceived to produce socially valid outcomes. One important index of social validation is the extent to which learners were more responsive during instruction with interspersed requests (Koegel, Dyer, & Bell, 1987). The same three individuals who rated task difficulty observed randomly selected and randomly sequenced videotapes of 12-trial blocks or 2-min sessions from the easy, hard, and hard + interspersed phases. After each segment, they used a 10-point Likert scale to rate the general responsiveness of the learner.

Design and Procedure

The study employed an A-B-A-B-C-B-C-D-E within-subject reversal design replicated across each of the 3 participants. The first four phases were an A-B-A-B functional analysis assessment of the extent to which aggression or self-injury functioned as an escape-motivated response (Carr & Durand, 1985; Durand & Crimmins, 1987, 1988). Phases 4 through 7 of the design provided a B-C-B-C analysis of the extent to which interspersed requests affected the attempts and aggression or self-injury of participants during training with hard tasks. The final two phases of the study (D, E) provided a validation assessment of the extent to which the effects were consistent across time, trainers, and tasks. Data for the initial seven phases of the study were collected over 2 days. The last two phases (D, E) were collected during a second 2-day period 2 months later. The specific procedures for each phase were as follows:

Easy. The easy phase involved presentation of easy tasks. Abel performed 12 trials, and Bob and Carol performed the tasks for approximately 10 min. During training, the task materials were presented with an instruction to complete the task. If

the learner performed the task correctly, verbal praise was delivered and small edibles (e.g., popcorn, cereal, raisins) were provided after approximately every three correct trials. If an error was made or no progress occurred for a period of 20 s, the trainer stopped the trial, replaced the materials to the position at which the error occurred, and provided increasing physical, gestural, or verbal assistance to obtain correct responding (Bellamy *et al.*, 1979). Praise was delivered following a correct response. If aggression or self-injury occurred during a trial, the trainer physically interrupted self-injurious or aggressive responses and redirected the person to the task by repeating the general instruction to perform the task. (The redirection procedure had been in use prior to initiation of the study.) A new trial was not begun unless the participant had not engaged in aggression, self-injury, or screaming for the preceding 5 s. Praise was also delivered periodically after periods without aggression or self-injurious behavior for "working hard."

Hard. The procedures of the hard phase replicated those of the easy phase except that the tasks were different. During the hard phase those tasks identified by staff as difficult for the participant (i.e., correct <33% of trials) were presented.

Hard + interspersed requests. The procedures in this phase replicated the procedures of the hard phase. However, at the beginning of each training session, after about every three training trials and following any indication of resistance (whining, grunting, etc.), the trainer interspersed three to five short, simple requests. Different requests were selected for each participant from those recommended by trainers as requests that required short responses (2 to 3 s) and that the person had a high probability of performing correctly (e.g., "give me five," "shake my hand," "give me the pen," "put this cap in your pocket"). During the course of the study, the 3 participants responded correctly to every presentation of these requests.

Following the recommendations of Engelmann and Colvin (1983) and Mace *et al.* (1988), each interspersed request was followed by verbal praise, and the hard task was presented within 5 s of completing the last interspersed request.

New trainer. Data from this phase were designed to assess both the durability of the effects and the extent to which novel events could be introduced. The new trainer phase was conducted 2 months after the last hard + interspersed requests session. In the intervening period, the interspersed requests procedure had been used unsystematically in the group home by a variety of trainers with a number of different tasks. The new trainers, however, had not worked with the participants. During the new trainer phase, a novel trainer presented the same task in the same setting used during the hard + interspersed requests phase.

New trainer + new task. During this phase, all training procedures were replicated except that new hard tasks were introduced. The new tasks were labeling objects with manual signs, signing "I want _____," and hand washing for Abel, Bob, and Carol, respectively.

RESULTS

Aggression and Self-Injury

The results of this study are presented in Figure 1. The patterns for aggressive or self-injurious responses were consistent across the 3 participants. The initial four phases of the study document a pattern in which aggression or self-injury was much higher during training on hard tasks. In only one observation period across all 3 participants was aggression observed during instruction with easy tasks, yet aggression or self-injury was observed in all but two periods during instruction with hard tasks. Across the first four phases, Abel performed no aggression during easy phases and 71.3% across hard phases. Bob and Carol performed aggression or self-injury 2.5% and 0% during easy phases, and 71.3% and 49.8% during hard phases.

Across Phases 4 through 7 the 3 participants also demonstrated very consistent patterns in their aggressive and self-injurious responses. The phases in which hard tasks were presented continued to be associated with high levels of aggression or self-injury. When the interspersed procedure was added, the level of aggression or self-injury plummeted. During the B-C-B-C reversals across Phases 4 through 7, Abel, Bob, and Carol, respectively, av-

eraged 69.6%, 63.9%, and 62.5% across the two hard phases and 0%, 7%, and 19.5% across the two hard + interspersed phases.

After a 2-month break, the 3 participants completed the last two phases of the study (new trainer and new trainer + new task). During the new trainer phase, all 3 participants maintained low levels of aggression or self-injury similar to those they had demonstrated during the hard + interspersed phases (means for Abel, Bob, and Carol were 9%, 9%, and 15%, respectively). They maintained similar low levels of aggression or self-injury during the new trainer + new task phase (means for Abel, Bob, and Carol were 6%, 6%, and 3%, respectively).

Attempts to Complete Task

The patterns of attempts to complete the tasks for the 3 participants present a more complex picture (see Figure 2). Abel was unique in performing with an unvarying pattern across all conditions. He initiated responding within 3 s of being presented with a task in every instance. Bob and Carol performed attempts with greater variability. During the first four phases, both Bob and Carol attempted to perform nearly every easy trial but made fewer attempts when hard tasks were presented. Bob attempted to complete 99% of the trials in the two easy phases and 61% of the trials in the first two hard phases. Carol attempted to perform 100% of the trials in the two easy phases and only 4% of the trials across the first two hard phases.

Across Phases 4 through 7 a B-C-B-C reversal pattern was observed. Both participants were less likely to attempt performance during hard trials (63% and 7% of trials attempted for Bob and Carol, respectively) than they were during the two hard + interspersed phases (99% and 73% trials attempted for Bob and Carol, respectively). Both participants maintained high levels of attempts during the new trainer and new task + new trainer phases.

Independent Variable Controls

Results from the independent variable controls confirm that the critical features of the procedures

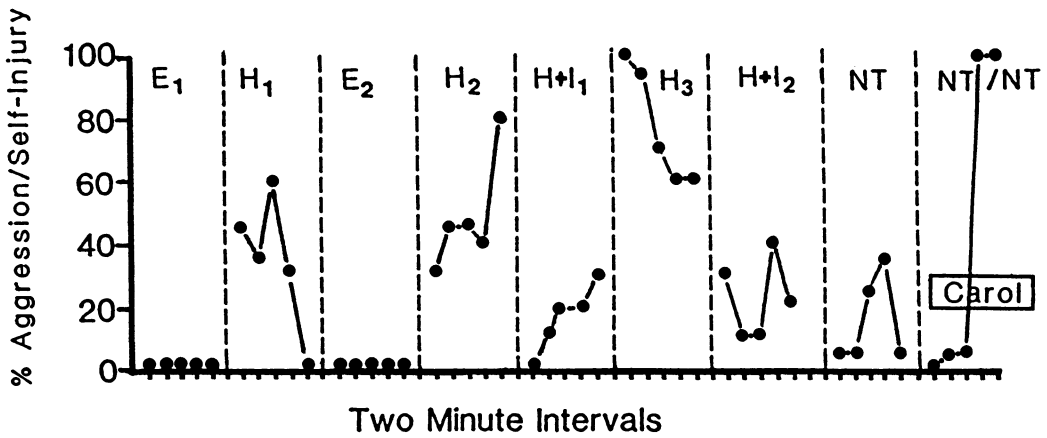
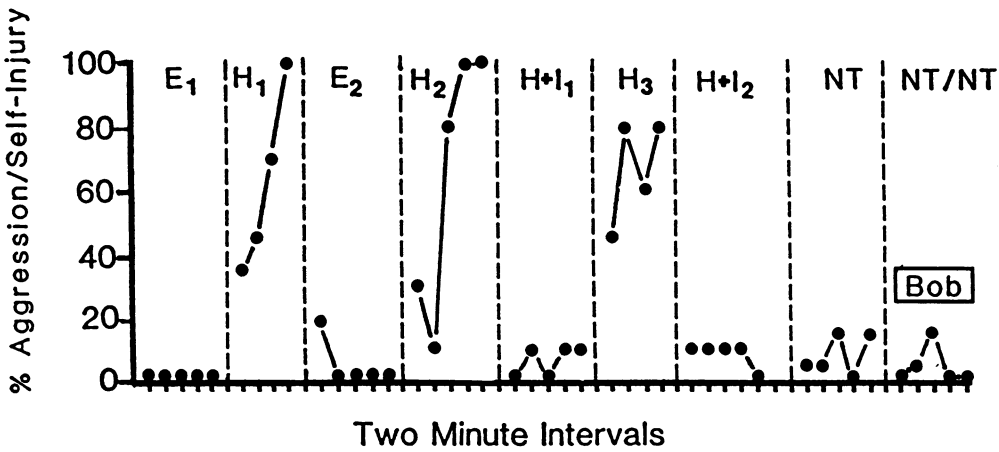
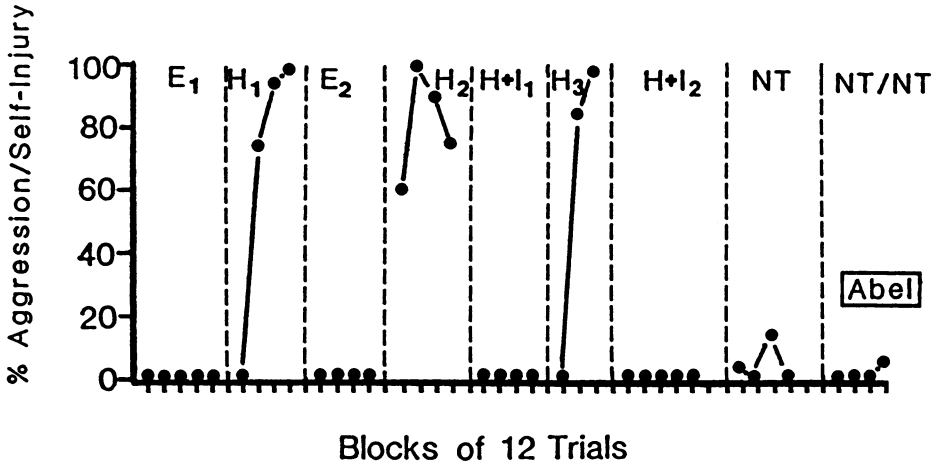


Figure 1. The percentage of trials or observation intervals in which aggression or self-injury was observed across all phases for Abel, Bob, and Carol. E = easy; H = hard; H + I = hard + interspersed; NT = new trainer; and NT/NT = new trainer/new task.

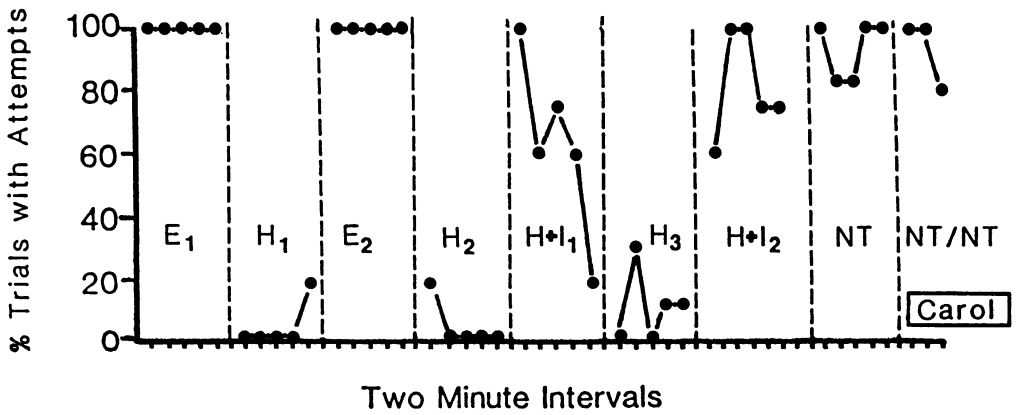
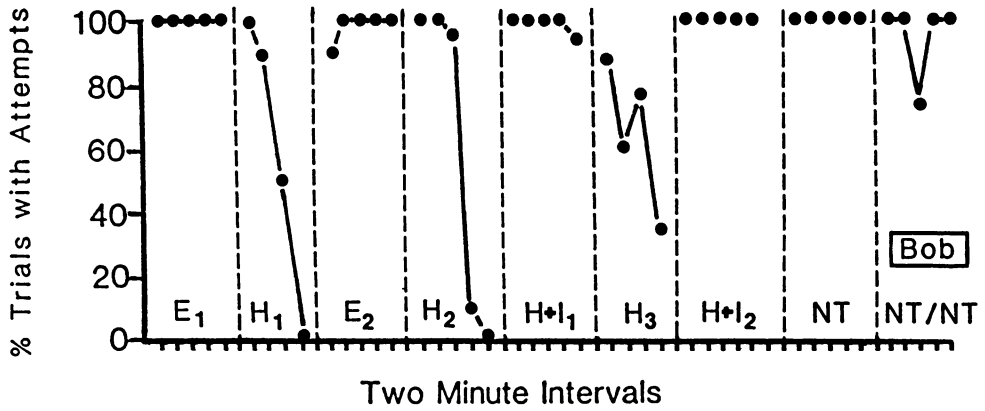
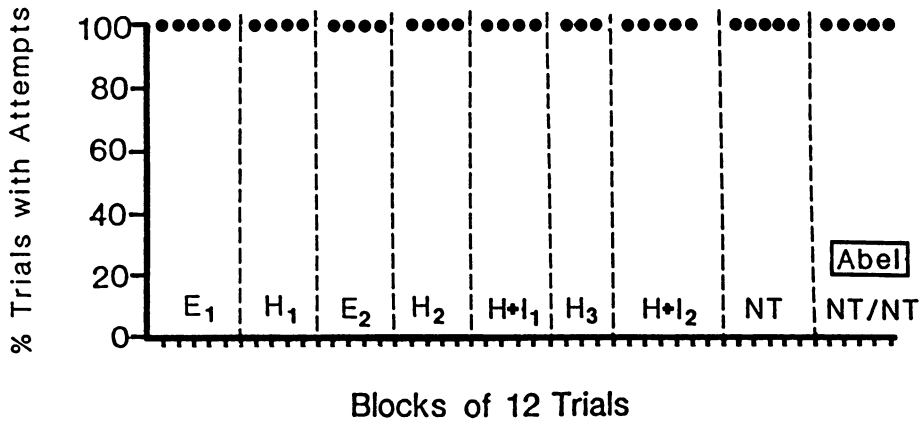


Figure 2. The percentage of trials in which Abel, Bob, and Carol attempted to perform the task. E = easy; H = hard; H + I = hard + interspersed; NT = new trainer; and NT/NT = new trainer/new task.

Table 1
Trials Per Minute

Participants	Phases					
	Easy	Hard	Easy	Hard	Hard + interspersed	Hard + interspersed
Abel	4.1	4.7	3.6	3.6	3.9	3.6
Bob	8.5	5.4	8.4	4.3	4.7	5.8
Carol	11	5	11	4	4	3

were implemented consistently. Across the two easy phases, the 3 participants averaged 78.7% of all trials correct without assistance. During the three hard phases, the 3 subjects averaged only 21.3% of the trials correct. During the two hard + interspersed phases and the last two phases, the 3 participants averaged 36.3% and 13.5% correct trials, respectively. The percentage of intervals in which praise was delivered was maintained between 79% and 89% across all phases.

The data for trials per minute indicate that Bob and Carol performed more trials during easy than during hard phases (Table 1), but that there was no difference in the number of trials per minute observed between hard phases and hard + interspersed phases, even though only trials on hard tasks were counted (interspersed requests were not counted as trials). Data on trials per minute were not collected during the last two phases of the study.

The perceived difficulty of the tasks was assessed by having three nondisabled adults observe randomly selected segments of videotape from the three main phases of the study (easy, hard, and hard + interspersed). Observers rated task difficulty in each segment on a 10-point scale (1 = easy, 10, hard). Results indicated that observers considered the easy tasks to be easier than the hard tasks (easy $M = 3$; hard $M = 8.5$). Similar levels of difficulty were observed for the hard and hard + interspersed segments (hard $M = 8.5$; hard + interspersed $M = 7.5$).

Social Validation Data

Results of the observer assessments of participant responsiveness (1 = not responsive, 10 = very responsive) showed that participants were perceived

to be most responsive during the easy ($M = 8.1$) and hard + interspersed ($M = 7.2$) phases and least responsive during the hard ($M = 2.1$) phase.

SUMMARY OF STUDY 1

The first four phases of the study provide functional analysis assessments documenting that aggression or self-injury was maintained by negative reinforcement (i.e., avoidance of difficult tasks). The B-C-B-C reversal design across Phases 4 through 7 provides strong support for a functional relationship between use of interspersed requests and reduced levels of aggression or self-injury. The final two phases dispel concerns that specific features of hard tasks, the time of year, or specific characteristics of the trainers were responsible for the effects.

We hypothesized that the participants would be more likely to attempt to perform a trial in phases in which they had higher likelihood of success (easy, hard + interspersed). Abel's data were inconsistent with this hypothesis. His results documented an unvarying pattern of attempts, regardless of procedures. Bob and Carol provided patterns indicating higher levels of attempts during easy phases than during hard phases, and higher levels of attempts during hard + interspersed phases than during hard phases. Bob and Carol not only engaged in aggression or self-injury more often during the hard phases, but they also stopped trying to complete the tasks.

A major limitation of this study is that all data were collected over a brief period (2 days). The short period emphasizes the power of the procedure to produce immediate changes, but it is unclear whether interspersed requests are appropriate across longer training sessions and in typical school set-

tings. Study 2 was designed to address these limitations.

STUDY 2

METHOD

Participant and Setting

Greg was 14 years old at the time of the study and had been labeled moderately mentally retarded and mildly spastic in gross motor movements due to a lesion in his brain stem. Greg did not use verbal speech effectively but he was able to whine and grunt to convey desires. He attended a self-contained classroom for students with severe disabilities in a regular public middle school. Greg was able to use a limited number of American Sign Language hand signs to communicate. He had excellent receptive communication skills and was learning to operate a hand-held electronic communication device. The teaching staff indicated that Greg performed a number of undesirable behaviors during instructional sessions, including hitting staff, pulling hair, kicking, grabbing, running away, yelling, and destruction of property in the form of chair throwing and ripping of materials. Greg was taking 350 mg of Dilantin per day to control seizures during the study. The study was conducted in Greg's classroom, where the trainer, one or two observers, and up to three other students were usually present.

Measurement

The percentage of 10-s intervals in which targeted behaviors occurred was recorded for each session. Observers used a partial-interval observation format. If the behavior occurred at any time during the 10-s interval, an occurrence was recorded for that interval.

Three graduate students in special education served as observers. The primary observer coded behaviors for all sessions, and two other individuals participated as reliability observers. All observers were trained by monitoring Greg during instructional sessions and by observing videotaped samples of instruction. Observers participated in the study only after documenting at least 90% agreement on all codes for five consecutive sessions.

Dependent variables. As in Study 1, the major dependent variables were aggression and attempts to perform the task. The same definitions for these variables used in Study 1 were applied in Study 2. Data were collected by an independent observer monitoring instructional sessions and recording the percentage of 10-s intervals in which aggression and attempts occurred at least once.

Independent variables. To control for the potential confounding effects of misapplication of independent variable manipulations, three additional variables were monitored. Independent observers recorded the percentage of correct trials to assess the difficulty of a task, the number of 10-s intervals during a session in which the trainer delivered praise, and the number of intervals in which the interspersed request procedure was applied.

Interobserver agreement. Interobserver agreement was assessed during 16 of the 38 sessions (including at least one session in every phase). A second observer independently scored each of the dependent and independent variables. Agreement between observers was compared on an interval-by-interval basis for each variable except percentage of correct trials, which was assessed on a trial-by-trial basis. Observer agreement for aggression averaged 93.5% (range, 75% to 100%); for attempts to complete task, $M = 87.6\%$ (range, 69% to 100%); for trainer praise, $M = 87.9\%$ (range, 65% to 100%); for interspersed requests, $M = 98.5\%$ (range, 92% to 100%); for percentage of correct trials, $M = 100\%$.

Design and Procedure

The design replicated the first seven phases of Study 1 (A-B-A-B-C-B-C). The first four phases provided an A-B-A-B analysis of the extent to which aggression was related to instruction on hard tasks. Phases 4 through 7 provided a B-C-B-C analysis of the extent to which the addition of the interspersed requests affected responding on hard tasks. Instructional sessions for all phases lasted 10 to 15 min or until Greg's behavior escalated to unacceptable levels (which occurred in only one session). One or two sessions were conducted each school day. Greg sat at a table and was given an

instructional task from his individualized education plan (IEP) and a verbal request to perform the task. If he performed the task correctly, he was praised and a new task (or trial) was presented. If an error occurred, Greg was interrupted and the instructional cue was repeated with more detail. If three consecutive errors were made on a task, a new task was presented. These procedures were constant across the three conditions of the study.

Easy. The easy phase involved instruction on tasks that Greg had learned earlier and could perform correctly. Easy tasks were defined as tasks in which 70% or more of the trials within a session were performed correctly without teacher assistance. Three easy tasks were used: (a) card games (fish, old maid), (b) counting whole dollars, and (c) receptive labeling of lunch and restaurant menus. Multiple tasks were presented in each instructional session.

Hard. Hard tasks were defined as tasks in which Greg performed 33% or fewer of the trials correctly without assistance. To avoid a situation in which acquisition across sessions would change the difficulty of a task, a group of six hard tasks was selected, and multiple tasks were presented during a session. If Greg performed more than 33% correct on two consecutive sessions, that task was dropped. The six hard tasks were (a) counting exact change with coins, (b) opening a combination lock, (c) tying a shoe, (d) using a calculator to compute simple sums, (e) using a typewriter to type out a dictated word or sentence, and (f) using a newspaper to identify sight words about the local weather.

Hard + interspersed requests. This phase replicated the hard + interspersed phase of Study 1. The trainer presented three to five short requests (e.g., stand up, give me the item, close the book) with praise at the beginning of the session and every one to three trials during a session.

RESULTS

Aggression

Figure 3 presents Greg's results for aggression and attempts across the seven phases. As in Study 1, the first four phases document very low levels

of aggression during easy instruction (Easy 1, $M = 0\%$; Easy 2, $M = 3.3\%$) and dramatic increases in aggression during instruction on hard tasks (Hard 1, $M = 34\%$; Hard 2, $M = 45\%$). Phases 4 through 7 document a pattern in which aggression was higher during the two hard phases ($M = 45\%$ for Hard 2 and 25.9% for Hard 3) and lower during the two interspersed phases ($M = 13.3\%$ for Hard + Interspersed 1 and 7.6% for Hard + Interspersed 2). Of particular note was the immediacy with which aggression decreased upon the introduction of the interspersed procedure.

Attempts to Complete Task

Results for attempts to perform the task are presented in the lower panel of Figure 3. The first four phases document an A-B-A-B reversal pattern with attempts more likely during the easy phases than during the hard phases. The average percentage of intervals with an attempt across the four phases was 90%, 69%, 93%, and 69%. As anticipated, the hard + interspersed phases were associated with high levels of attempts ($M = 89.7\%$ and 91.7%). Attempts stayed high, however, during the third hard phase ($M = 84\%$).

Independent Variable Controls

The tasks used in the study conformed to the criteria for easy and hard phases. Greg correctly performed 80% or more of the trials within a session during the two easy phases, but never performed more than 30% of the trials correctly during any session during the hard or hard + interspersed phases.

The trainer delivered praise in 45% to 55% of intervals across all phases except the first hard phase, in which praise was delivered in 28% of the intervals. Interspersed requests were used appropriately during the hard + interspersed phases and were not used during other phases.

SUMMARY OF STUDY 2

The first four phases provided a functional analysis documenting the relationship between task difficulty and aggression during instruction. Greg was more likely to be aggressive against the teacher

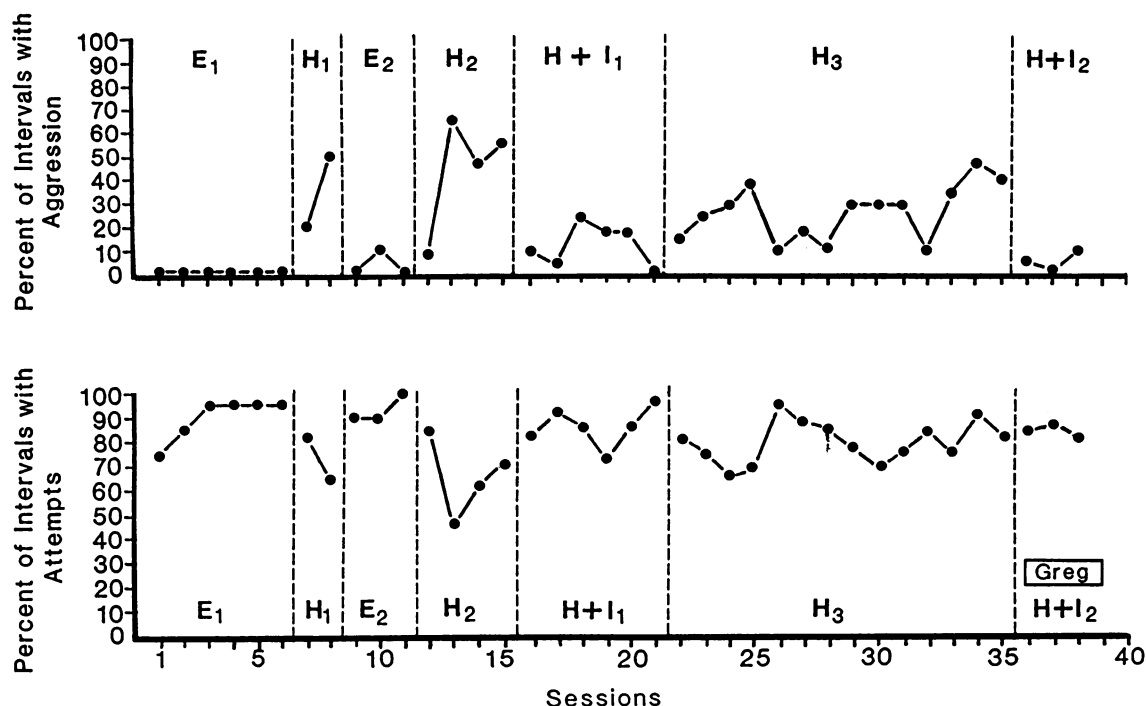


Figure 3. The percentage of observation intervals in which aggression was observed for Greg (top) and the percentage of intervals in which Greg made attempts to complete the task (bottom). E = easy; H = hard; and H + I = hard + interspersed.

when difficult tasks were presented. This pattern changed, however, when interspersed requests were used in conjunction with hard tasks. The interspersed requests procedure was effective at decreasing the level of aggression observed during instruction.

As in Study 1, the first four phases documented a relationship between attempts to complete the task and level of task difficulty. It also was anticipated that attempts would be high during the hard + interspersed phases and stay lower during the hard phases. This pattern was partially borne out. Level of attempts did increase when the interspersed procedure was introduced, but as in Study 1, after Greg experienced training with the interspersed procedure the rate of attempts remained high regardless of the conditions in later phases.

GENERAL DISCUSSION

The two studies in this report document interspersed requests as a simple, effective, and efficient

antecedent intervention for decreasing the aggression and self-injury of students during instruction on new or difficult tasks. An important feature of both studies is the functional analysis assessment data documenting that the aggression or self-injury of participants was associated with difficult tasks and not with easy tasks. This implies that these target behaviors were maintained by negative reinforcement (i.e., to avoid or escape difficult learning situations) and not to obtain teacher attention or avoid all instructional situations.

Why Do Interspersed Requests Work?

We believe interspersed requests are effective at reducing undesirable behaviors and increasing instructional behaviors because they provide temporally proximal reinforcement for the response class "instruction following." One of the most frequently used formats for teaching is the presentation of an instruction (e.g., "put on the shirt"), which is to be followed by student performance of the instructed task (e.g., putting on the shirt). This for-

mat can be viewed in a stimulus-response equation as the presentation of a stimulus from the stimulus class "instructions" followed by a response from the response class "following instructions." It is possible that interspersed requests are effective because the learner experiences three to five varied examples from the stimulus class "instructions" that are followed by correct instruction following and reinforcement. The next instruction may be new or difficult, but it is of the same stimulus class. Our knowledge of generalization theory (Engelmann & Carnine, 1982; Horner, Bellamy, & Colvin, 1984; Johnston & Pennypacker, 1980; Stokes & Baer, 1977) predicts that the use of (a) a small array of interspersed requests, (b) multiple reinforcers, and (c) interspersed requests temporally proximal to the difficult requests will increase attempts to perform new or difficult tasks. This analysis and the present results are consistent with previous results reported by Koegel and Egel (1979), Koegel, O'Dell, and Dunlap (1988), Koegel, O'Dell, and Koegel (1987), and Sailor, Guess, Rutherford, and Baer (1968) on motivating students with autism and severe mental retardation.

An alternative interpretation of this phenomenon has been offered by Mace and his colleagues (Mace et al., 1988). They suggest that behavioral momentum (Nevin, 1974) provides a parsimonious explanation for the effect. Behavioral momentum refers to the increased likelihood of a response to occur following reinforcement of that response. The current design provided insufficient control to separate the applicability of these two interpretations.

The Role of Attempts

Our technology of instruction is based on the delivery of sufficient reinforcement to support instructional effort on the part of the student, and the use of prompting, shaping, and fading to develop the correct form of the targeted skill. With people who have great difficulty learning, we may fail to acknowledge the need to deliver sufficient reinforcement for maintaining attempts to perform the task. If reinforcement is contingent upon correct performance and not on attempting to complete the task, a student who has difficulty learning may

behave as if the attempt itself were on extinction. Interspersed requests may be a procedure for increasing the general likelihood that a student will attempt to follow instructions. Only when attempts occur do the traditional instructional procedures become operational.

A Nonaversive Response to Aggression or Self-Injury

An important feature of the two studies was the substantial reduction of intense aggression or self-injury without manipulation of consequence variables. Throughout the study, participants were blocked from hurting themselves or others and were redirected to the task when aggression or self-injury occurred. This procedure had been in place for many weeks prior to the study without impact on the level of aggression or self-injury. By modifying antecedent variables associated with the presumed function of the target behaviors, there was a dramatic reduction in the level of aggression or self-injury without resort to more intrusive consequences (cf. Carr & Durand, 1985; Carr et al., in press; Evans & Meyer, 1985). This effect was consistent with current efforts to emphasize the importance of a functional analysis prior to the development of a support plan, and the use of minimally intrusive behavior support procedures (Durand & Carr, 1987; Iwata et al., 1982; La Vigna & Donnellan, 1986; Lovaas & Favell, 1987; Touchette, MacDonald, & Langer, 1985).

One danger of using interspersed requests is the possibility that they could function to reinforce undesirable behavior. A student may learn that when presented with a hard task, he can be aggressive and get the easier, interspersed requests. It may be important to ensure that interspersed requests are delivered at the beginning and throughout the session, and not just after undesirable behavior has occurred.

Teaching Adaptive Behaviors

Carr et al. (in press) have demonstrated that students who are aggressive or self-injurious when presented with hard tasks may inadvertently train their teachers to avoid difficult or novel tasks. The

educational impact of this "child effect" on teacher behavior may be that the student fails to learn an array of important skills that could make his or her life more rich, varied, and independent. The present results are encouraging in that they provide an alternative for teachers who are faced with difficult behavior during instructional situations. The problem behavior of a student may indicate that the task is difficult or undesirable. The teacher should first question whether the task is really of importance for the child (Snell, 1987; Wilcox & Bellamy, 1987), and if so, whether the application of interspersed requests is a viable approach for continuing instruction without punishment for the teacher or the student. The validation results from the teachers in the present report provide preliminary support that the interspersed requests method is an approach that teachers will be willing and able to adopt.

Future Research Needs

Becker and Engelmann (1978) suggest that the interspersed requests procedure should be effective in three situations: (a) to increase ease of transitions from more preferred to less preferred activities, (b) to increase responsiveness during training sessions, and (c) to reduce the escalation of a response chain that leads to severe aggression or self-injury (Engelmann & Colvin, 1983). The present report and the results of Mace et al. (1988) provide support for the second of these situations, and the study by Singer et al. (1987) provides support for the first situation. At present there has not been an empirical analysis of the third of these recommended uses of interspersed requests.

A growing body of research suggests that increased attention should be paid to the responsiveness of learners during instruction. The use of natural teaching situations (McGee, Krantz, & McClannahan, 1985, 1986), maintenance tasks (Dunlap & Koegel, 1980; Sailor et al., 1968), and interspersed requests (Engelmann & Colvin, 1983; Mace et al., 1988; Singer et al., 1987) provides examples of related efforts to make instructional situations motivating, effective, and functional. Combined with traditional prompting, pacing, cor-

recting, and reinforcing procedures, these strategies pose a major advance in supporting the education of children who have learned to ignore or resist difficult instructional situations.

REFERENCES

- Becker, W. C., & Engelmann, S. (1978). Systems for basic instruction: Theory and applications. In A. Catania & T. Brigham (Eds.), *Handbook of applied behavior analysis: Social and instructional processes* (pp. 325-378). New York: Irvington Publishers, Inc.
- Bellamy, G. T., Horner, R. H., & Inman, D. (1979). *Vocational habilitation of severely retarded adults: A direct service technology*. Baltimore: University Park Press.
- Brown, L., Nietupski, J., & Hamre-Nietupski, S. (1976). The criterion of ultimate functioning. In M. A. Thomas (Ed.), *Hey, don't forget about me!* (pp. 2-15). Reston, VA: CEC Information Center.
- Carr, E. G. (1977). The motivation of self-injurious behavior: A review of some hypotheses. *Psychological Bulletin*, *84*, 800-816.
- Carr, E. G., & Durand, V. M. (1985). The social-communicative basis of severe behavior problems in children. In S. Reiss & R. Bootzin (Eds.), *Theoretical issues in behavior therapy* (pp. 219-254). New York: Academic Press.
- Carr, E. G., Taylor, J. C., & Robinson, S. (in press). The effects of severe behavior problems in children on the teaching behavior of adults. *Journal of Applied Behavior Analysis*.
- Dunlap, G. (1984). The influence of task variation and maintenance tasks on the learning and affect of autistic children. *Journal of Experimental Child Psychology*, *37*, 41-64.
- Dunlap, G., & Koegel, R. L. (1980). Motivating autistic children through stimulus variation. *Journal of Applied Behavior Analysis*, *13*, 619-627.
- Dunlap, G., & Plien, A. L. (1988). Generalization and maintenance of unsupervised responding via remote contingencies. In R. H. Horner, G. Dunlap, & R. L. Koegel (Eds.), *Generalization and maintenance: Lifestyle changes in applied settings* (pp. 121-142). Baltimore: Paul H. Brookes.
- Durand, V. M., & Carr, E. G. (1987). Social influences on self-stimulatory behavior: Analysis and treatment application. *Journal of Applied Behavior Analysis*, *20*, 119-132.
- Durand, V. M., & Crimmins, D. B. (1987). Assessment and treatment of psychotic speech in an autistic child. *Journal of Autism and Developmental Disorders*, *17*, 17-28.
- Durand, V. M., & Crimmins, D. B. (1988). Identifying the variables maintaining self-injurious behaviors. *Journal of Autism and Developmental Disorders*, *18*, 99-117.
- Engelmann, S., & Carnine, D. (1982). *Theory of instruc-*

- tion: *Principles and applications*. New York: Irvington Publishers, Inc.
- Engelmann, S., & Colvin, D. (1983). *Generalized compliance training: A direct-instruction program for managing severe behavior problems*. Austin, TX: Pro-Ed.
- Evans, I. M., & Meyer, L. H. (1985). *An educative approach to behavior problems: A practical decision model for interventions with severely handicapped learners*. Baltimore: Paul H. Brookes.
- Horner, R. H., Bellamy, G. T., & Colvin, G. T. (1984). Responding in the presence of nontrained stimuli: Implications of generalization error patterns. *Journal of the Association for Persons with Severe Handicaps*, *9*, 287-296.
- Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1982). Toward a functional analysis of self-injury. *Analysis and Intervention in Developmental Disabilities*, *2*, 3-20.
- Johnston, J. M., & Pennypacker, H. S. (1980). *Strategies and tactics of human behavioral research*. Hillsdale, NJ: Lawrence Erlbaum.
- Koegel, R. L., Dyer, K., & Bell, L. K. (1987). The influence of child-preferred activities on autistic children. *Journal of Applied Behavior Analysis*, *20*, 243-252.
- Koegel, R. L., & Egel, A. (1979). Motivating autistic children. *Journal of Abnormal Psychology*, *88*, 418-426.
- Koegel, R. L., O'Dell, M., & Dunlap, G. (1988). Motivating speech use in nonverbal autistic children by reinforcing attempts. *Journal of Autism and Developmental Disabilities*, *17*, 187-200.
- Koegel, R. L., O'Dell, M. C., & Koegel, L. K. (1987). A natural language teaching paradigm for non-verbal autistic children. *Journal of Autism and Developmental Disorders*, *17*, 187-200.
- LaVigna, G. W., & Donnellan, A. M. (1986). *Alternatives to punishment: Solving behavior problems with non-aversive strategies*. New York: Irvington Publishers, Inc.
- Lovaas, O. I., & Favell, J. E. (1987). Protection for clients undergoing aversive/restrictive interventions. *Education and Treatment of Children*, *10*, 311-325.
- Mace, F. C., Hock, M. L., Lalli, J. S., West, B. J., Belfiore, P., Pinter, E., & Brown, D. F. (1988). Behavioral momentum in the treatment of noncompliance. *Journal of Applied Behavior Analysis*, *21*, 123-141.
- McGee, J. J., Krantz, P. J., & McClannahan, L. E. (1985). The facilitative effects of incidental teaching on preposition use by autistic children. *Journal of Applied Behavior Analysis*, *18*, 17-32.
- McGee, J. J., Krantz, P. J., & McClannahan, L. E. (1986). An extension of incidental teaching procedures to reading instruction for autistic children. *Journal of Applied Behavior Analysis*, *19*, 147-158.
- Neef, N. A., Iwata, B. A., & Page, T. J. (1980). The effects of interspersal training versus high density reinforcement on spelling acquisition and retention. *Journal of Applied Behavior Analysis*, *13*, 153-158.
- Nevin, J. A. (1974). Response strength in multiple schedules. *Journal of the Experimental Analysis of Behavior*, *21*, 389-408.
- Nevin, J. A. (1979). Reinforcement schedules and response strength. In M. Zeiler & P. Harzem (Eds.), *Reinforcement and organization of behavior* (pp. 117-158). New York: John Wiley & Sons.
- Nevin, J. A., Mandell, C., & Atak, J. R. (1983). The analysis of behavioral momentum. *Journal of the Experimental Analysis of Behavior*, *39*, 49-59.
- Sailor, W., Guess, D., Rutherford, G., & Baer, D. M. (1968). Control of tantrum behavior by operant techniques during experimental verbal training. *Journal of Applied Behavior Analysis*, *1*, 237-244.
- Singer, G. H. S., Singer, J., & Horner, R. H. (1987). Using pretask requests to increase the probability of compliance for students with severe disabilities. *Journal of the Association for Persons with Severe Handicaps*, *12*, 287-291.
- Snell, M. E. (1987). *Systematic instruction of persons with severe handicaps*. Columbus, OH: Merrill Publishing Company.
- Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis*, *10*, 349-367.
- Storey, K., & Horner, R. H. (1988). Pretask requests help manage behavior problems. *Direct Instruction News*, *7*(2), 1-3.
- Touchette, P. E., MacDonald, R. F., & Langer, S. N. (1985). A scatter plot for identifying stimulus control of problem behavior. *Journal of Applied Behavior Analysis*, *18*, 343-351.
- Wilcox, B., & Bellamy, G. T. (1987). *The activities catalog: An alternative curriculum for youth and adolescents with severe disabilities*. Baltimore: Paul H. Brookes.
- Winterling, V., Dunlap, G., & O'Neill, R. (1987). The influence of task variation on the aberrant behavior of autistic students. *Education and Treatment of Children*, *10*, 105-119.
- Wolf, M. M. (1978). Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis*, *11*, 203-214.

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